13, 17 and 20, which previously depended on claim 11 have been amended to depend on new claim 21. These claims and the remaining claims, claims 15, 16, 18 and 19, have also been amended to improve their form. Reconsideration is expressly requested.

The specification has also been amended to insert headings and to correct idiomatic errors noted therein. The Abstract has also been amended to improve its form. No new matter has been entered.

The Applicants wish to thank the Examiner for the courtesy of a telephone conference on January 22, 2003, the substance of which is recorded herein. The Examiner had called to indicate that it might expedite prosecution of this application if the case could be reviewed to improve the form of the specification and claims so as to conform with U.S. practice.

In response, Applicants have rewritten claims 11 and 14 as new claims 21 and 22 and have amended claims 12-13 and 15-20 to improve their form. In addition, headings have been introduced in the specification and other changes have been made to improve

the form thereof. Due consideration and allowance are respectfully requested.

Respectfully submitted,
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I hereby certify that this correspondence is being sent by facsimile-transmission to the Assistant Commissioner for Patents, Washington, D.C. 20231, on January 28, 2003.

Frederick J. Dorchak

EXHIBIT A

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Marked-up Version of the Prior Pending
Abstract Showing the Changes Made

ABSTRACT OF THE DISCLOSURE

[The invention relates to a] A method is provided for processing a seismic 3-D measurement data set, consisting of a multitude of seismic traces, each having a sequence of amplitude values or data points provided with acoustic impedances. [Said] The method consists of the following: selecting a reference section at a predetermined location and depth which comprises [neighbouring] neighboring trace sections of several seismic traces; determining the similarity between the selected reference section and [localised] localized sections of seismic data from the measurement data set; creating a volume of data which corresponds to the measurement data record, using the similarity value which has been determined and allocated to each data point as the attribute. During processing of the seismic data, [the inventive method enables] the sub-surface images are able to be classified by an absolute comparison of the measurement data with a reference sample section as the means of interpretation.

EXHIBIT B

Marked-up Version of the Prior Pending
Paragraphs Showing the Changes Made

Pages 3-4, for the paragraph bridging pages 3 and 4, please substitute the following paragraph:

--A method for seismic data processing is known from WO 96/18915. In [said] this method, a seismic 3-D volume is divided in a multitude of horizontal slices, which are vertically disposed one on top of the other and spaced from each other, whereby at least one slice is divided in a multitude of cells. In this connection, each cell comprises at least 3 portions of traces whereby the first and the second trace portions are arranged in a vertical plane in the direction of the profiling (= inline), and the third trace portion and the first trace portion are arranged in a vertical plane substantially perpendicular to the direction of the profiling (= crossline). A cross correlation is then carried out between each two trace portions in the two vertical planes. Such a cross correlation supplies inline and crossline values that are dependent on layer dip. Combination of these values in a cell yields a coherency value for the cell that is assigned to a data point of the cell. The final result in turn is a 3-D data volume from which any desired sections can be extracted and displayed.--

Page 4, for the first full paragraph, please substitute the following paragraph:

--A method and a device for seismic data processing by means of the coherency characteristics are known from EP 0 832 442 A1, whereby in a manner similar to the method of the patent cited

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above, a seismic volume is divided in horizontal slices and the latter in turn are divided in cells. [Said] The cells have the shape of cubes in the simplest case. Based on the trace portions present in the cells, which amount to at least two in each cell, a correlation matrix is formed as the sum of the differences between inner and outer products of the sets of values from the trace portions. The quotient formed by the highest Eigen value of the matrix and the sum of all Eigen values is then calculated as the measure for the coherency. The result is again a 3-D volume comprised of coherency values.--

Page 5, for the first full paragraph, please substitute the following paragraph:

--Furthermore, a method for determining physical properties of the subsurface is known from EP 626 594 A1. In [said] this process, a comparison is carried out between a seismic reference trace recorded at a well location and a reference trace obtained synthetically from log data of a well. Modified synthetic seismograms are subsequently generated that are compared with the other seismic traces. However, only two trace segments are compared to each other, namely one trace segment of a seismic trace and one trace segment of a synthetically generated seismic trace. Lateral environments are consequently not taken into account.--

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Pages 5-6, for the paragraph bridging pages 5 and 6, please substitute the following paragraph:

--Furthermore, an image processing method is known from the published DGMK (Deutsche Gesellschaft für Mineralölwissenschaft und Kohlechemie = German Society for Petroleum and Coal Chemistry) Conference Report [1996] "Image Processing of Seismic Attributes and Geostatistics in the Upper carbon" by C. HELLMICH, H. TRAPPE and J. FERTIG. [Said] This method permits a quantitative characterization of seismic representations and thus further interpretations of the lithology. Different image processing filters are employed to amplitude maps in this process, and the variations, or the continuity, respectively, of the amplitude values of the closer environment are quantified. [Said] The filters represent 2-D multi-trace filters, which are used for taking the local environment around a data point into account. Operators employed for this purpose are the entropy and the dispersion, among others. Maps for the interpretation can be generated for the interpretation with all attributes. The quantities "entropy" or "dispersion" are in this respect measures that quantify the variations or continuities of the amplitude in the local environment.--

Pages 6 and 7, for the paragraph bridging pages 6 and 7, please substitute the following paragraph:

--It has to be emphasized in this context that only relative comparisons in the local environment of a data point are considered in the methods described above. Laterally continuous and gradually changing conditions of the surroundings, for example, are consequently not conspicuous in connection with [said] these processing methods. Even in connection with the implementation according to claim 19 of WO 96/18915, only a

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relative similarity, i.e. a similarity based on the individual cell is determined first. The similarity values so calculated are compared with similarity values of a volume with a known hydrocarbon reservoir that have been calculated in the same way, and the well location is determined in the newly investigated volume based on the comparison of the coherency values with the coherency values of the volume of the known hydrocarbon reservoir. However, only coherency values relatively determined in a local environment (cell) are included in the comparison in this case as well.--

Page 7, for the second full paragraph, please insert the following paragraph:

--[Said] The problem is solved with a method [as defined in claim 1] in accordance with the invention.--

Pages 7-8, for the paragraph bridging pages 7 and 8, please substitute the following paragraph:

--If the geological conditions of the subsurface to be explored are known at a location in the region covered by the seismic data volume, for example based on information collected from a well, the similarity of the seismic signals in the entire volume of measured data is determined, using the signal on [said] the location having the known geology. It is assumed in this context that similar geological conditions generate a similar seismic signal in order to transfer in this manner via the similarity determination the geological conditions known in the drilling location to other regions as well, or to find such conditions again there as well, respectively.--

Page 14, for the second full paragraph, please substitute the following paragraph:

--FIG. 1 shows a schematic representation of a 3-D data volume 1 comprising a multitude of seismic traces, which are not shown explicitly. A square stone-shaped section 2 is shown in the data volume 1, with three time series in the form of the seismic trace portions 21, 22 and 23 being arranged by way of example on [said] section 2. The local data section 2 preferably comprises three to seven neighboring traces per lateral direction, for example 5 x 5 traces with a time length of 5 data points (samples) as well, which at a sampling rate of 4 ms thus conforms to a time slice of 20
ms.--

Page 15, for the first full paragraph, please substitute the following paragraph:

--FIG. 3 shows the result of a reference analysis as defined by the invention for a geological horizon with a constant lithology. A slice is cut for this purpose from the 3-D data set along [said] the interface of the layer. Based on the well "a" with the ascertained lithological information, a cube-shaped reference pattern with 3 x 3 x 3 data points (samples) was selected in analogy to the section in FIG. 1.--

Page 16, for the first full paragraph, please substitute the following paragraph:

--On the other hand, FIG. 4 shows a less calm lithology for the same analysis region. The layer interface selected in the present case is assigned to a sandstone horizon which represents a potential reservoir for hydrocarbons. Similarity features were calculated based on a reference pattern section derived from the

well "a", whereby, according to the gray scale gradation shown on the right, the similarity values are on a distinctly lower level than those in FIG. 3. While high similarity values are found as expected in the surroundings of well "a", differences appear toward the eastern part of the analysis region, which is shown on the map on the right. In [said] <u>the</u> area of lower similarity, the well "b" encountered a dense sandstone that is not suited as a reservoir horizon. It has to be noted here that some of the fault zones visible in FIG. 3 can be recognized also in the range of said layer interface in FIG. 4.--

EXHIBIT C

Marked-up Version of the Prior Pending Claims 12-13 and 15-20 Showing the Changes Made

12. (Amended) The method according to claim [11, characterized in that] 21, wherein the size of the reference section and the local sections comprises 3 to 7 data points per dimensional direction.

13. (Amended) The method according to claim [11, characterized in that] 21, wherein the local sections and/or the reference section are deformed according to a local preferred dip and preferred dip direction.

15. (Amended) The method according to claim 13, [characterized in that] wherein during the selection of the reference section, a search is carried out for the dip and dip direction exhibiting the largest similarity among the trace portions belonging to the reference section, whereby afterwards in the determination of the similarity between the reference section and local sections, the specific relative dip between the reference section and the local section conforming to the largest similarity is then determined in each case.

16. (Amended) The method according to claim 13, [characterized in that] wherein in addition to the data volume with the similarity values, a data volume with the determined dip values and a further data volume with the determined values of the dip direction are formed.

17. (Amended) The method according to claim [11, characterized in that] 21, wherein the reference section is supplied by a well with ascertained lithological information.

18. (Amended) The method according to claim 17, [characterized in that] wherein the reference section is generated synthetically by convolving down a pre-selected 3-dimensional acoustic impedance distribution from the relevant well log with a representative wavelet.

19. (Amended) The method according to claim 17, [characterized in that] wherein the reference section is formed synthetically with the help of seismic 3-D modeling techniques from a geological model determined by lithological, petrophysical and/or structural parameters.

20. (Amended) The method according to claim [11, characterized in that] 21, wherein several reference sections, for example locations of drilled holes, are compared with the local sections, and thus several similarity values are calculated for each data point.--